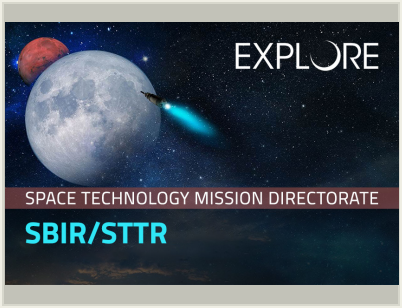
Unconditionally Stable Low Dropout Regulators for Extreme Environments, Phase II

Completed Technology Project (2011 - 2014)

Project Introduction

We have developed a low dropout (LDO) regulator using a patented MESFET transistor technology that can be manufactured in commercial CMOS foundries with no changes to the process flow. The regulator is stable under all load conditions without an external compensation capacitor, thereby reducing the mass/volume of the power management system and increasing reliability. The MESFET-based LDO component has very competitive figures of merit (dropout voltage, transient response, power supply rejection) compared to existing components. During Phase 1 we confirmed that the components were unconditionally stable without an external compensation capacitor over the temperature range -196C to +150C and for radiation doses up to 1 Mrad(Si). We shall build on the Phase 1 design effort to demonstrate two fully integrated LDO regulators rated up to 1A with dropout voltages of less than 50 mV. One part will be fabricated using a qualified rad-hard SOI CMOS foundry in collaboration with Honeywell, one of our commercialization partners. The other component will be fabricated using the low-cost/high-volume foundry available from IBM. Both parts will have a nominal output voltage of 1.8V with 1% accuracy. Other designs will target user adjustable voltages in the range 1.2-2V. The feasibility of using the MESFET technology for low voltage applications (e.g. 0.8V) will be explored. All parts will be tested over the temperature range -150C to +150C and after irradiation exposure to a TID of 1 Mrad from a Co-60 source. The enhanced low dose rate sensitivity (ELDRS) of the components will be studied using a low dose rate Cs-137 source. The characteristics of all the components will be documented, and parts made available to NASA and potential customers as deliverables from the Phase 2 activity. We shall work with our commercialization partners to have the LDO regulator design adopted as a licensed 'IP block' and to develop low cost versions for the wider consumer electronics market.



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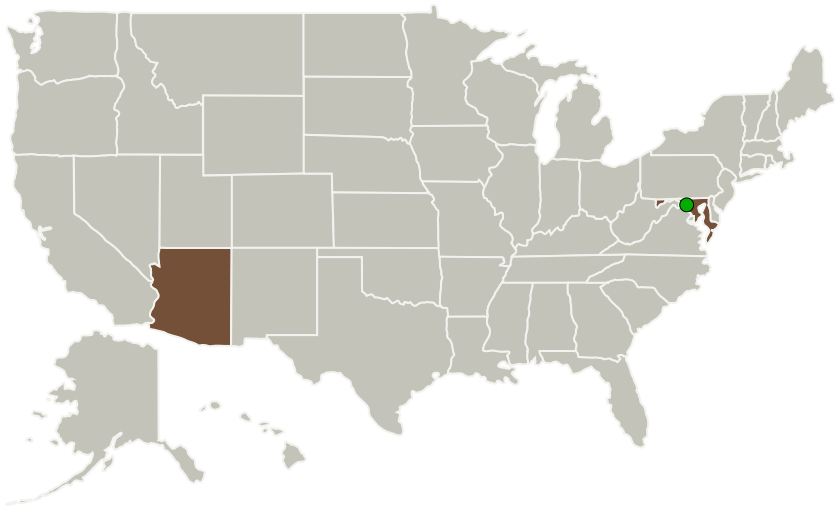
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
SJT Micropower	Lead Organization	Industry	Fountain Hills, Arizona
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
Arizona	Maryland

Project Transitions

June 2011: Project Start

March 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139409)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

SJT Micropower

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

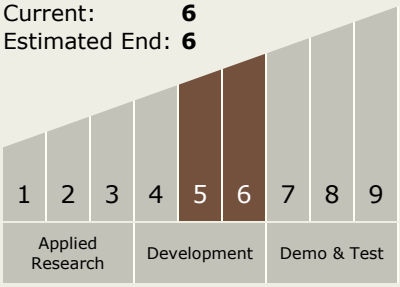
Carlos Torrez

Principal Investigator:

Seth Wilk

Technology Maturity (TRL)

Start: **5**
Current: **6**
Estimated End: **6**



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Technology Areas

Primary:

- TX10 Autonomous Systems
  - TX10.1 Situational and Self Awareness
    - TX10.1.4 Hazard Assessment

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System